

Historic, Archive Document

Do not assume content reflects current
scientific knowledge, policies, or practices.

ASD 354

23
Reserved

IND/STA

Photo Series for Quantifying Forest Residues in the:

Northern Hardwood Type
Oak-Hickory Type

United States
Department of
Agriculture
Forest Service
Pennsylvania
Department of
Environmental
Resources -
Bureau of
Forestry

NA-FR-22
Broomall, PA
1982

Frederick Wilcox
John McCarty
Barry Bungard



U.S. FOREST SERVICE
NATIONAL FOREST RESOURCES
PROGRAM

May 1982

U.S. FOREST SERVICE
NATIONAL FOREST RESOURCES
PROGRAM

787338

Acknowledgment

A series of 14 photographs which display different forest residue loading levels for areas of like timber type, cutting practice or insect and disease mortality.

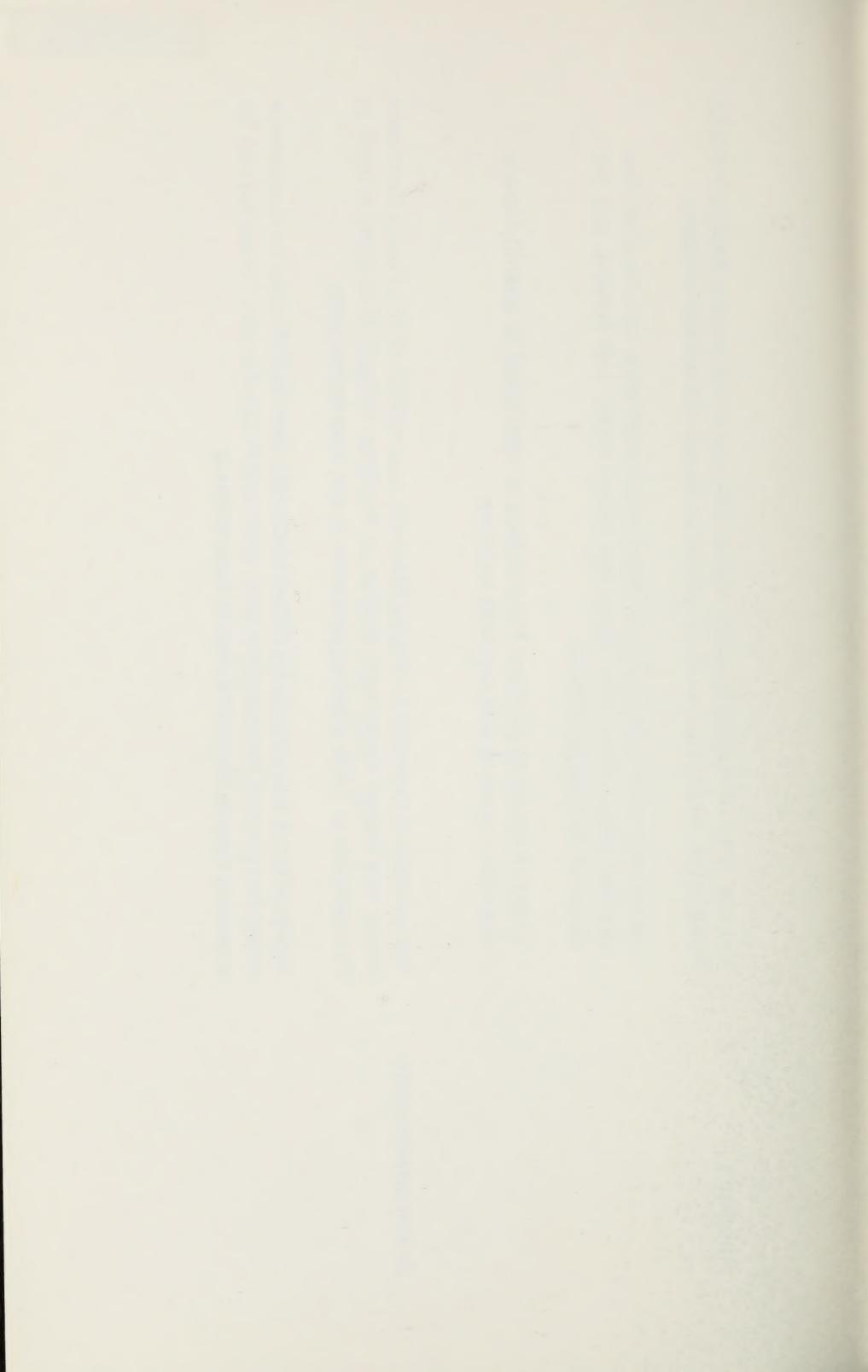
Information with each photo includes measured weights, volumes and other residue data, information about the timber stand and harvest, and fire behavior fuel model number.

These photo series provide a fast and easy-to-use means for quantifying and describing existing and expected residues.

Acknowledgment

Appreciation is extended to Wayne Maxwell, now retired, of the Pacific Northwest Forest and Range Experiment Station in Portland, Oregon, who spent a week in Pennsylvania in 1976 training personnel in the field techniques.

Appreciation is also extended to Robert McDonald, then Staff Director for Cooperative Forest Fire Control, Northeastern Area, State and Private Forestry, Forest Service, for arranging Wayne Maxwell's visit to Pennsylvania.



**List of Tree Species
Observed during
Field Inventory**

Sweet birch	<i>Betula lenta</i> L.
Yellow birch	<i>Betula alleghaniensis</i> Britton
American beech	<i>Fagus grandifolia</i> Ehrh
American basswood	<i>Tilia americana</i> L.
Yellow poplar	<i>Liriodendron tulipifera</i> L.
White ash	<i>Fraxinus americana</i> L.
Black locust	<i>Robinia pseudoacacia</i> L.
Black cherry	<i>Prunus serotina</i> Ehrh
Red maple	<i>Acer rubrum</i> L.
Sugar maple	<i>Acer saccharum</i> Marsh.
Black walnut	<i>Juglans nigra</i> L.
Aspen	<i>Populus</i>
Hickory	<i>Carya</i> Nutt.
Chestnut oak	<i>Quercus prinus</i> L.
Northern red oak	<i>Quercus rubra</i> L.
Scarlet oak	<i>Quercus coccinea</i> Muenchh.
White oak	<i>Quercus alba</i> L.
Eastern hemlock	<i>Tsuga canadensis</i> (L.) Carr.
Virginia pine	<i>Pinus virginiana</i> Mill.
Pitch pine	<i>Pinus rigida</i> Mill.
Eastern red cedar	<i>Juniperus virginiana</i> L.

Contents

What is this Photo Series?	1
Purpose of Photo Series	1
How Can They be Used?	3
Inventory of Down Residue	3
Determination of Desired Residue Level	4
Prediction of Residues from Planned Cutting or from Insect and Disease Infestation	5
National Fire Behavior Fuel Models	6
Fire Behavior Fuel Model Key	6
Fuel Model Descriptions and Expected Fire Behavior	8
Timber Group	8
Logging Slash Group	10
How Were They Developed?	11
How are Levels in this Series Coded?	11
Publications Credits	14

What is This Photo Series?

This photo series is an array of photos showing different residue loading levels found in natural timber stands of like types or generated from insect and disease mortality or from cutting practices. Each photo is supplemented with information which includes:

- Measured quantities by size classes, average depth, ground area covered and other residue data
- Harvesting or mortality information
- Fuel Model

Thus, the series provide a basis for quantifying and describing existing and expected residue loadings on other areas and serve as a communication link between users.

Purpose of Photo Series

Forest residue is the woody debris present on the forest floor. It is made up of stems, branches, twigs, and bark. This residue is caused by natural events, mortality from insects or disease infestation, or from previous forestry operations. Together, the accumulated debris and slash can create a hazardous fuel situation that must be dealt with by the land manager. The most important reason for evaluating the forest

residue is to determine if the debris and slash presents an acceptable or unacceptable fire hazard to the selected crop trees or to the surrounding forest area. If the hazard is judged unacceptable, the land manager can make some decisions concerning fire prevention and suppression or the amount and type of treatment needed to abate the hazard.

The photo series can also be of value to the land manager from the standpoint of utilization. Much of the residues remaining in the forest following harvest operations can be utilized for fuel wood. By using the photos, the land manager can determine which areas can be utilized for fuel wood. Since some residues are beneficial for such purposes as nutrient cycling, soil protection, wildlife cover, and micro-climate effect, the land manager can also decide how much residue should be removed to reduce the residue to a level considered desirable. To reduce residues to a level considered desirable, estimates are needed on quantities that now exist or will be created by some activity.

Inventory techniques, such as the planar intersect method, are very useful when a high degree of accuracy is needed. However, these techniques are time consuming and costly to apply extensively. Photo series can be used to make fast, easy, and inexpensive quantifications of residue adequate for most management needs.

In the past there had been no way for all resource disciplines to become readily familiar with residue volumes and descriptions so that they could make accurate decisions relating to residue management, fire prevention planning, or expected fire behavior. These deficiencies can be overcome with the photo series.

How Can They be Used?

Inventory of Down Residue

Fuel loadings in various residue size classes, average residue depth, and ground area covered are characteristics that are visible in the photographs; hence, users can estimate any of these characteristics on an area being inventoried by comparing them with the photos as follows:

1. Observe each characteristic of the residue on the ground (e.g., 3.1 — to 9-inch loading).
2. Select a photo which nearly matches, or photos that bracket the observed characteristic.

3. Obtain the quantitative value for the characteristic being estimated from the data sheet accompanying the selected photo (or interpolate a value between photos).

These steps are repeated for each characteristic desired. If the general area being inventoried has zones of obvious differences in residue loading, the user should consider making separate determinations for each zone which can then be weighted and cumulated for the whole area.

Residue characteristics not distinguishable by use of the photographs are duff and litter depth, proportion of sound residue by species, and proportion rotted. If values for these characteristics are desired in an inventory, they must be derived from independent sampling or observations.

Inventory information can be used by land managers to (1) evaluate impact residues have on various aspects of forest management, (2) identify areas of unacceptable residue loading, (3) identify priority areas for treatment, (4) estimate amount of utilizable material, and (5) estimate fire behavior characteristics.

Land management objectives can be more nearly achieved if a team of appropriate specialists can participate in specifying residues which should remain on site after completion of a cutting activity. Individuals helping with these determinations can

**Determination
of Desired
Residue Level**

study the photo series to recognize the appearance of various quantities and distributions of residue. With this knowledge, each individual can describe in quantitative terms the residue they believe should be retained to meet environmental concerns and goals of their particular specialty. The group can then use the photo series as a communicative tool to resolve differences in arriving at a desired level.

After treatment, the degree to which objectives were achieved can be judged by comparing observed post-treatment loading with the desired level description.

Prediction of Residues from Planned Cutting or from Insect and Disease Infestation

Photo series are a rudimentary aid for predicting amounts of residue from cutting and insect and disease infestation. Many factors, such as condition of timber stand, topography, logging method, utilization intensity or intensity of insect and disease infestation, affect the volume of resulting residues; so users should bear in mind that these series depict only a few of the possible combinations.

To predict residue volumes from planned cutting, the user compares timber volume and size information from cutting plans with this kind of information in the photo series. Selecting a photo series level or levels with similar stand characteristics, the user refers to data sheet loadings, considers factors which differ from the photo series situations, and quantifies the loading expected.

Predicted loadings can be used to support changes in cutting and removal actions.

**National Fire Behavior
Fuel Models**

For each level presented, one of the 13 national fire behavior fuel models has been indicated. However, there are only six different fire behavior fuel models represented by this series; those of the timber and logging slash groups. The type and volume of the fuel residue, as well as the litter present on the site, possess all the fuel descriptors required by the fire behavior model. It should be remembered that the fire behavior fuel model is used in predicting fire behavior in surface wildfires.

The land manager can use the photo series by comparing the known fuel model represented in the pictures to areas on the ground for which the fire behavior fuel model is not known. This can be a very useful tool to the land manager unfamiliar with fire behavior fuel models or to anyone who must make a quick determination of the fire behavior fuel model on a given site.

Use of this photo series can also assist the land manager in fuel mapping and the determination of expected fire behavior on a given site.

**Fire Behavior Fuel
Model Key**

The following is a key to the six fire behavior fuel models represented in this series:

1. Timber Group

A. Surface fuels are mostly foliage litter. Large fuels are scattered and lie on the

needles, i.e., are not supported above it by branches. Green fuels are scattered enough to be insignificant to fire spread.

1. Dead foliage litter is short needle, 2" or less coniferous or small hardwood leaves tightly compacted Fuel Model 8
2. Dead foliage litter is long needle pine or hardwood leaves loosely compacted Fuel Model 9

B. There is a significant amount of larger fuels, many with attached branches and twigs, or the larger fuels have rotted enough that they are splintered and broken. The larger fuels are fairly well distributed over the area. Some green fuels may be present. The over-all depth of the fuel is probably below the knees Fuel Model 10

II. Logging Slash Group

- A. Slash is not continuous; other surface fuels, needle litter, or small amount of grass must be present to help carry the fire. Green fuels are absent or do not play a significant role in fire behavior. Over-all slash depth is about 1 foot Fuel Model 11

- B. Slash generally covers the ground, though there may be some bare spots or areas of light coverage. Average slash depth is about 2 feet. Slash is not excessively compacted. Approximately one-half of the needles may still be on the branches. Green fuels are absent or are not expected to affect fire behavior Fuel Model 12
- C. Same as B except needles that are still attached are red. Slash is continuous or nearly so. Slash is not excessively compacted. Approximately one-half of the needles are still on the branches. Green fuels are absent or are not expected to affect fire behavior Fuel Model 13

The following are further descriptions and some expected fire behavior for the six fire behavior fuel models represented by this photo series.

Fuel Model Descriptions and Expected Fire Behavior¹

Timber Group

Fire Behavior Fuel Model 8. Slow burning ground fires with low flame heights are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short needle conifers or hardwoods that have leafed out

¹From "Aids to selecting Fuel Models for Estimating Fire Behavior" by Hal. E. Anderson

support fire in the compact litter layer. This layer is mainly needles, leaves, and some twigs since little undergrowth is present in the stand.

Fire Behavior Model 9. Fires run through the surface litter faster than Model 8 and have higher flame height. Both long-needle conifer and hardwood stands especially the oak-hickory types, are typical. Fall fires in hardwoods are representative, but high winds will actually cause higher rates of spread than predicted. This is due to spotting caused by rolling and blowing leaves. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning activity.

Fire Behavior Fuel Model 10. The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch or larger limb wood resulting from overmaturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting and torching of individual trees is more frequent in this fuel situation leading to potential fire control difficulties. Any forest type may be considered if heavy down materials are present; examples are insect or disease-ridden stands, wind-thrown stands, over-mature situations with deadfall, and aged light thinning or partial-cut slash.

Logging Slash Group

Fire Behavior Fuel Model 11. Fires are fairly active in the slash and herbaceous material intermixed with the slash. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands and southern pine harvests are considered. Clearcut operations generally produce more slash than represented here. The less than 3-inch material load is less than 12 tons per acre.

Fire Behavior Fuel Model 12. Rapidly spreading fires with high intensities capable of generating fire brands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is less than 3-inches in diameter. These fuels total less than 35 tons per acre and give the impression of well distributed fuels. Heavily thinned conifer stands, clearcuts and medium or heavy partial cuts are represented.

Fire Behavior Fuel Model 13. Fire is generally carried across the area by a continuous layer of slash. Large quantities of greater than 3-inch material are present. Fires spread quickly through the fine fuels and intensity builds up more slowly as the large fuels start burning. Active flaming is sustained for long periods and a wide variety of fire brands can be generated. These contribute to spotting problems as the weather conditions become more severe. Clearcuts and heavy partial-cuts in mature and overmature stands are depicted where the slash load is dominated by the greater than 3-inch material.

How Were They Developed?

Areas photographed for this series were selected to show typical residue loading variations in the two major vegetative types of Pennsylvania, oak-hickory and northern hardwoods. Photos were taken and data collected as follows:

1. Areas were photographed and the material in the photo area sampled in accordance with USDA Forest Service national guidelines.²
2. Measurement technique was in accordance with the "Handbook for Inventorying Downed Woody Material".³
3. Timber stand, logging, and residue treatment information was obtained from timber sale or project records in field office.

How Are Levels in This Series Coded?

The data for each level are presented on the page facing the photo. Facing picture and data pages have the same code for the residue situation shown. The code shows:

- a. Order of rank from lightest loading to heaviest loading shown in the series of photographs.

²USDA, Forest Service, 1975. National fuel classification and inventory system, preliminary draft, 61 p., illus. Washington Office, Washington, DC.

³Brown, James K. 1974. Handbook for inventorying downed wood material. USDA, Forest Service, Gen. Tech., Rep. INT-16, 24 p., illus. Interm. For. and Range Exp. Stn., Ogden, Utah.

- b. Forest type: A = oak-hickory, B = northern hardwoods
- c. Forest Site Class, where:
 - 1. Dominant and co-dominant trees reach 3 or more 16' logs at maturity.
 - 2. Dominant and co-dominant trees reach 2 to $2\frac{1}{2}$ logs at maturity.
- d. Forest Size Class, where:
 - 1. Saw timber 14" d.b.h. and larger
 - 2. Large pole timber 8" to 14" d.b.h.
 - 3. Small pole timber 4" — 8" d.b.h.

e. History of Area, where:

N = Natural Stands, no cutting practices — includes those which have insect and disease mortality

CC = Clearcut

ST = Seed tree harvest

EXAMPLE: 1 B21 N is the first photo in the series, northern hardwoods, Site 2 (trees 2 to 2½ logs in height), trees 14" d.b.h. and larger, no thinning or harvest practices.

Publication Credits

Albini, Frank A. 1976a. Computer-based models of wildland fire behavior: a user's manual. 68 p., USDA For. Serv., Interm. For. and Range Exp. Stn., Ogden, Utah.

Albini, Frank A. 1976a. Estimating wildfire behavior and effects. USDA For. Serv. Gen. Tech. Rep. INT-30, 92 p., Interm. For. and Range Exp. Stn., Ogden, Utah.

Albini, Frank A., James K. Brown, David L. Bunnell, William C. Fischer, and J. A. Kendall Snell. 1977. User's guide to debris prediction and hazard appraisal. 34 p., USDA For. Serv., North. Reg., Missoula, Montana.

Anderson, Hale. Aids for selecting fuel models for estimating fire behavior. USDA Interm. For. and Range Exp. Stn., Ogden, Utah.

Brown, James K. 1974. Handbook for inventorying downed woody material. USDA For. Serv. Gen. Tech. Rep. INT-16, 24 p., Interm. For. and Range Exp. Stn., Ogden, Utah.

Koski, Wayne and William C. Fischer. 1979. Photo Series for Appraising Thinning Slash in North Idaho. USDA For. Serv. Tech. Rep., INT -49, 49 p., Interm. For. and Range Exp. Stn., Ogden, Utah.

Maxwell, Wayne G., and Franklin R. Ward. 1976b. Photo series for quantifying forest residues in the: ponderosa pine type, ponderosa pine and associated species type, lodgepole pine type. USDA For. Serv. Gen. Tech. Rep. PNW-52, 73 p., Pac. Northwest For. and Range Exp. Stn., Portland, Oregon.

Rothermel, Richard C. 1972. A mathematical model for predicting fire spread in wildland fuels. USDA For. Serv. Res. Pap. INT-115, 40 p., Intermt. For. and Range Exp. Stn., Ogden, Utah.

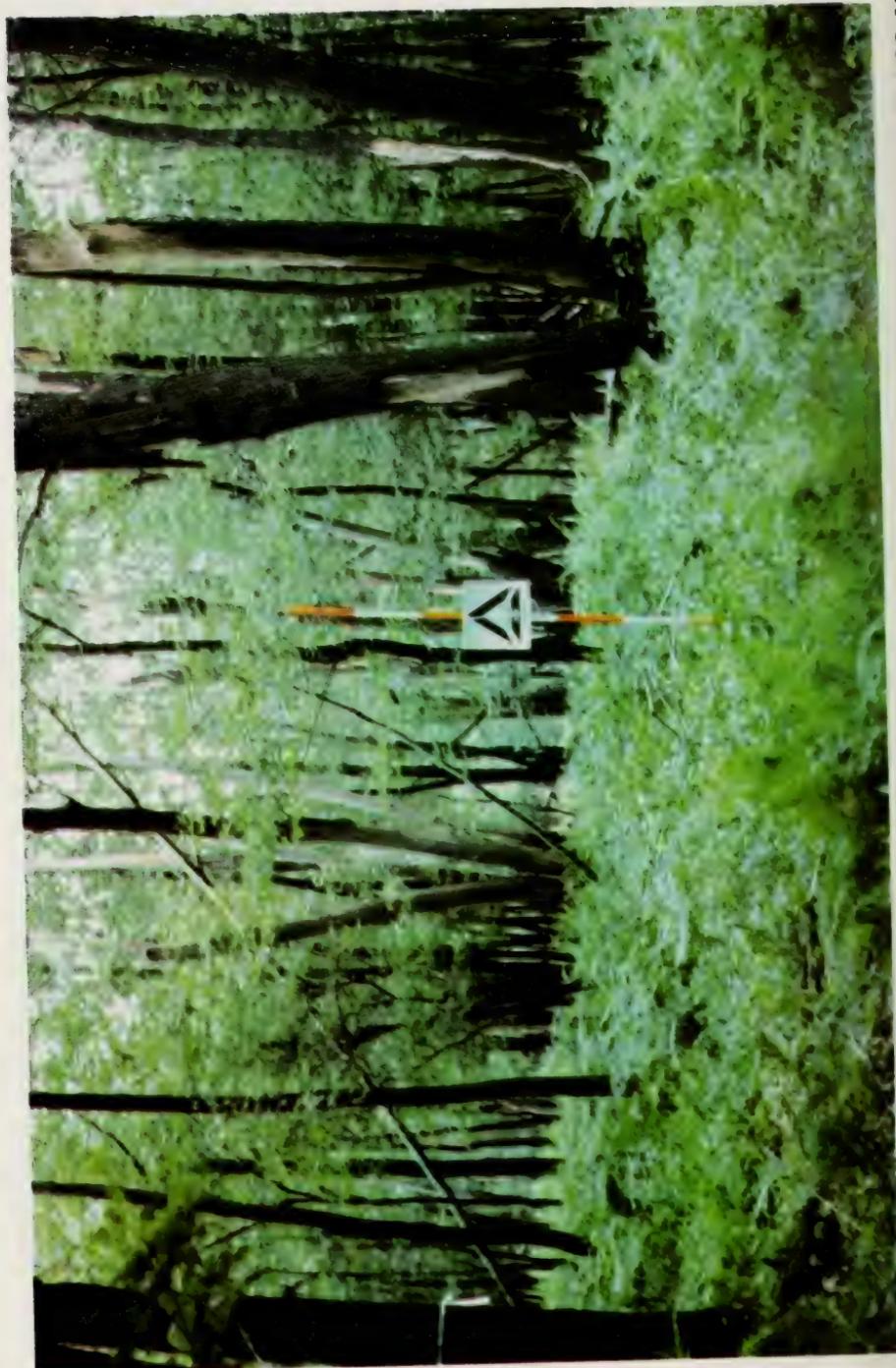
USDA Forest Service. 1975. National fuel classification and inventory system, preliminary draft. 61 p., Washington Office, Washington, D.C.

Field work for this project was performed in the Commonwealth of Pennsylvania by the following personnel of the Pennsylvania Department of Environmental Resources Bureau of Forestry:

Fred Wilcox, Project Leader, Forester
John McCarty, Forest Technician
Barry Bungard, Forest Technician



LOADING				OTHER MEASUREMENTS			
Size class (inches)	Weight (tons/acre)	$V_{0.1}$ volume (ft ³ /acre)	Average residue depth	Ground area covered by residue	1/4-inch diameter and larger	Average duff and litter depth	(feet) .9 (percent) 24
0.25-1.0	1.6	81.6					(inches) 1.5
1.1-3.0	1.4	68.1					
3.1-9.0				Sound residue 3.1-inch diameter and larger	Mixed Oaks		(percent) 85
9.1-20.0					Red Maple	(percent) 8	
20.1+						(percent)	
Total	6.7	355.5		Rotted residue 3.1-inch diameter and larger			(percent) 7
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION			
Gross volume cruised (mbf/acre)				Stems cut/acre	FUEL MODEL		
Net volume cruised (mbf/acre)				Stems remaining/acre	Fire Behavior Fuel Model 9		
Average stems/acre cut				Basal area/acre before			
Average d.b.h. of stems cut (inches)				Basal area/acre after			
Stand age (years)				Average d.b.h. before (inches)			
Cutting prescription				Average d.b.h. after (inches)			
Yarding method				Thinning method			
Slash treatment				Slash treatment			
Period since cut or treatment (months)							



LOADING				OTHER MEASUREMENTS			
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)	Average residue depth	(feet)	(percent)	(feet)	(percent)
0.25-1.0	1.1	56.0	Ground area covered by residue 1/4-inch diameter and larger	41			
1.1-3.0	4.3	218.7	Average duff and litter depth	1.5			
3.1-9.0			Sound residue 3.1-inch diameter and larger				
9.1-20.0				Mixed Oaks	90		
20.1+				Other	6		
Total	7.1	311.8	Rotted residue 3.1-inch diameter and larger				
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION			
Gross volume cruised (mbf/acre)				Stems cut/acre			
Net volume cruised (mbf/acre)				Stems remaining/acre			
Average stems/acre cut				Basal area/acre before			
Average d.b.h. of stems cut (inches)				Basal area/acre after			
Stand age (years)				Average d.b.h. before (inches)			
Cutting prescription				Average d.b.h. after (inches)			
Yarding method				Thinning method			
Slash treatment				Slash treatment			
Period since cut or treatment (months)				Mortality 75%			



LOADING				OTHER MEASUREMENTS			
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)		Average residue depth		(feet)	.25
0.25-1.0	.4	20.3		Ground area covered by residue 1/4-inch diameter and larger		(percent)	16
1.1-3.0	.7	35.6		Average duff and litter depth		(inches)	1.3
3.1-9.0				Sound residue 3.1-inch diameter and larger	Red Maple	(percent)	35
9.1-20.0					Red Oak	(percent)	20
20.1+					Others	(percent)	20
Total	7.3	384.7		Rotted residue 3.1-inch diameter and larger		(percent)	25

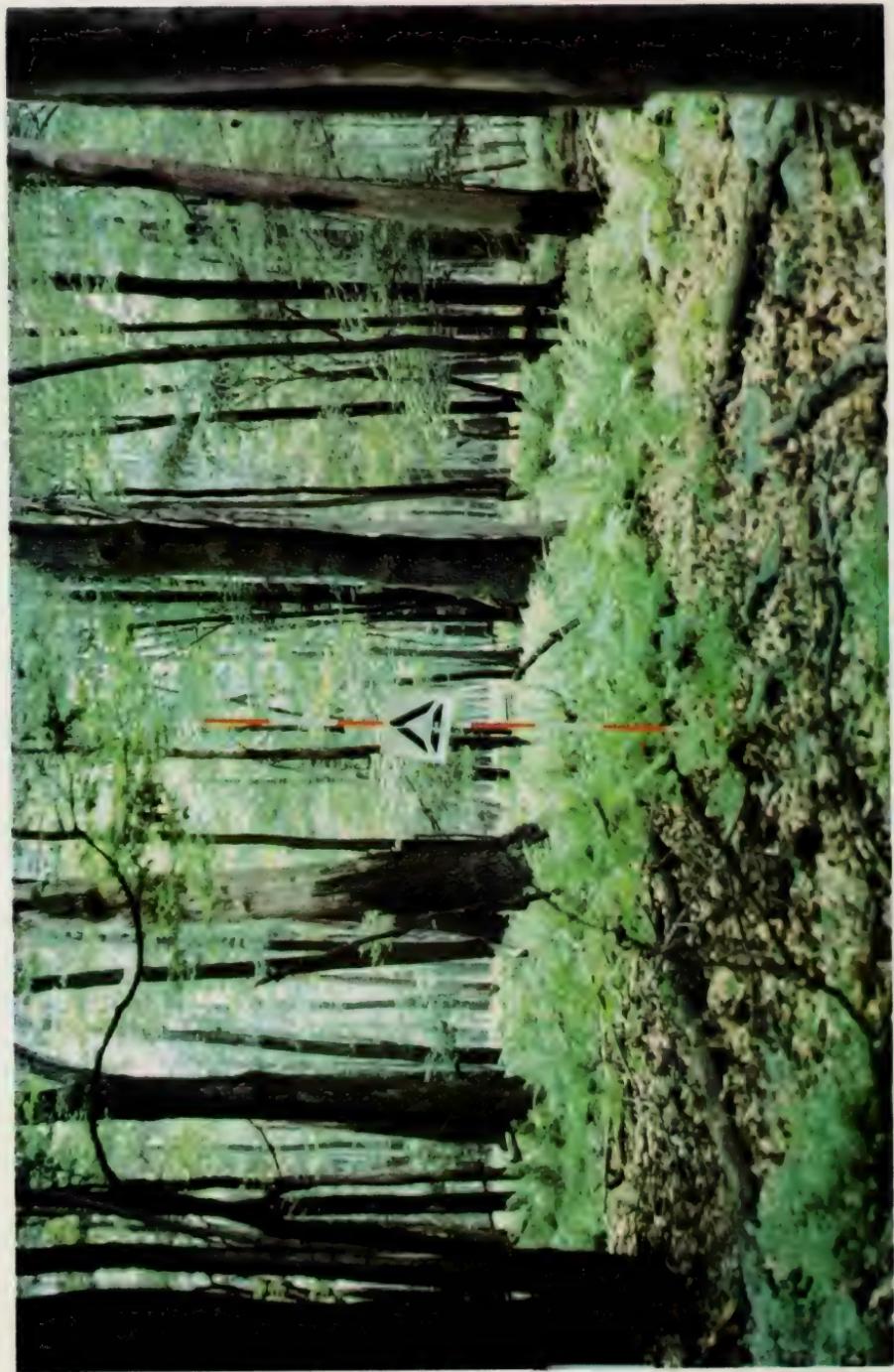
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION				FUEL MODEL	
Gross volume cruised (mbf/acre)		Stems cut/acre						Fire Behavior Fuel Model 3	
Net volume cruised (mbf/acre)		Stems remaining/acre							
Average stems/acre cut		Basal area/acre before							
Average d.b.h. of stems cut (inches)		Basal area/acre after							
Stand age (years)		Average d.b.h. before (inches)							
Cutting prescription		Average d.b.h. after (inches)							
Yarding method		Thinning method							
Slash treatment		Slash treatment							
Period since cut or treatment (months)									



LOADING				OTHER MEASUREMENTS			
Size class (inches)	Weight (tons/acre)	V ₃ volume (ft ³ /acre)	Average residue depth	(percent)	(percent)	(inches)	(feet)
0.25-1.0	1.9	91.3	Ground area covered by residue 1/4-inch diameter and larger	38			1.0
1.1-3.0	3.0	147.0	Average duff and litter depth		2.1		
3.1-9.0			Sound residue 3.1-inch diameter and larger	Mixed Oaks	75		
9.1-20.0				Red Maple		(percent)	
20.1+				Others	15	(percent)	
Total	9.4	465.0	Rotted residue 3.1-inch diameter and larger		9	(percent)	1
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION			
Gross volume cruised (mbf/acre)				Stems cut/acre			
Net volume cruised (mbf/acre)				Stems remaining/acre			
Average stems/acre cut				Basal area/acre before			
Average d.b.h. of stems cut (inches)				Basal area/acre after			
Stand age (years)				Average d.b.h. before (inches)			
Cutting prescription				Average d.b.h. after (inches)			
Yarding method				Thinning method			
Slash treatment				Slash treatment			
Period since cut or treatment (months)							



LOADING				OTHER MEASUREMENTS			FUEL MODEL	
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)	Average residue depth				Fire Behavior	Fuel Model
0.25-1.0	1.0	53.2	Ground area covered by residue 1/4-inch diameter and larger				(percent) 36.0	
1.1-3.0	2.5	128.4	Average duff and litter depth				(inches) 1.2	
3.1-9.0			Sound residue 3.1-inch diameter and larger	Beech			(percent) 70	
9.1-20.0				Black birch			(percent) 9	
20.1+				Others			(percent) 5	
Total	9.4	578.1	Rotted residue 3.1-inch diameter and larger				(percent) 16	
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION			FUEL MODEL	
Gross volume cruised (mbf/acre)				Stems cut/acre			Fire Behavior	Fuel Model
Net volume cruised (mbf/acre)				Stems remaining/acre				
Average stems/acre cut				Stems basal area/acre before				
Average d.b.h. of stems cut (inches)				Basal area/acre after				
Stand age (years)				Average d.b.h. before (inches)				
Cutting prescription				Average d.b.h. after (inches)				
Yarding method				Thinning method				
Slash treatment				Slash treatment				
Period since cut or treatment (months)								



DATA SHEET

Residue descriptive code 6 A12 N

LOADING			OTHER MEASUREMENTS		
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)	Average residue depth Ground area covered by residue 1/4-inch diameter and larger	(feet)	(percent)
0.25-1.0	1.7	84.5	Average duff and litter depth	1.6	40
1.1-3.0	4.8	243.6	Sound residue 3.1-inch diameter and larger	2.1	
3.1-9.0			mixed oaks	70	
9.1-20.0	5.2	290.7	others		20
20.1+					
Total	11.7	618.8	Rotted residue 3.1-inch diameter and larger	(percent)	10
HARVEST INFORMATION			PRE-COMMERCIAL THINNING INFORMATION		
Gross volume cruised (mbf/acre)	Stems cut/acre		FUEL MODEL		
Net volume cruised (mbf/acre)	Stems remaining/acre		Fire Behavior Fuel Model	10	
Average stems/acre cut	Basal area/acre before				
Average d.b.h. of stems cut (inches)	Basal area/acre after		REMARKS		
Stand age (years)	Average d.b.h. before (inches)				
Cutting prescription	Average d.b.h. after (inches)				
Yarding method	Thinning method				
Slash treatment	Slash treatment				
Period since cut or treatment (months)			Mortality 60%		



LOADING

Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)	Average residue depth	Ground area covered by residue 1/4-inch diameter and larger	(feet)	1.0
0.25-1.0	.8	40.7			(percent)	30
1.1-3.0	3.6	183.1	Average duff and litter depth		(inches)	1.4
3.1-9.0			Sound residue 3.1-inch diameter and larger	Red Maple	(percent)	60
9.1-20.0		416.4		Red Oak	(percent)	14
20.1+				Others	(percent)	12
Total	12.3	640.2	Rotted residue 3.1-inch diameter and larger		(percent)	14

HARVEST INFORMATION

Gross volume cruised (m³)
Net volume cruised (m³)
Average stems/acre cut
Average d.b.h. of stems
cut (inches)
Stand age (years)
Cutting prescription
Yarding method
Slash treatment
Period since cut or
treatment (months)

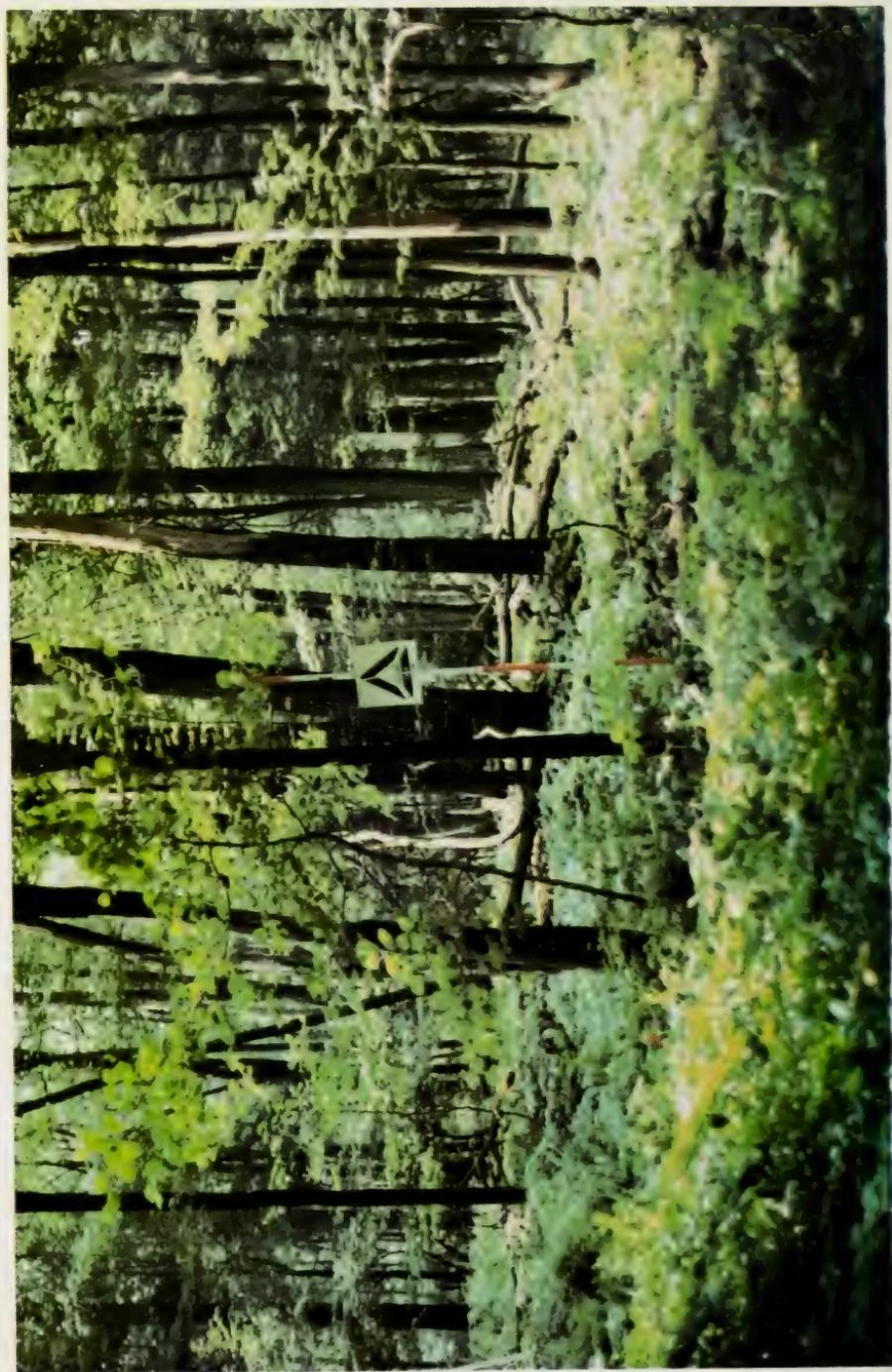
PRE-COMMERCIAL THINKING INFORMATION

	Fire Behavior	Fuel Model	8
Stems cut/acre			
Stems remaining/acre			
Basal area/acre before	140		
Basal area/acre after			
Average d.b.h. before (inches)			
Average d.b.h. after (inches)			
Thinning method			
Slash treatment			
REMARKS			

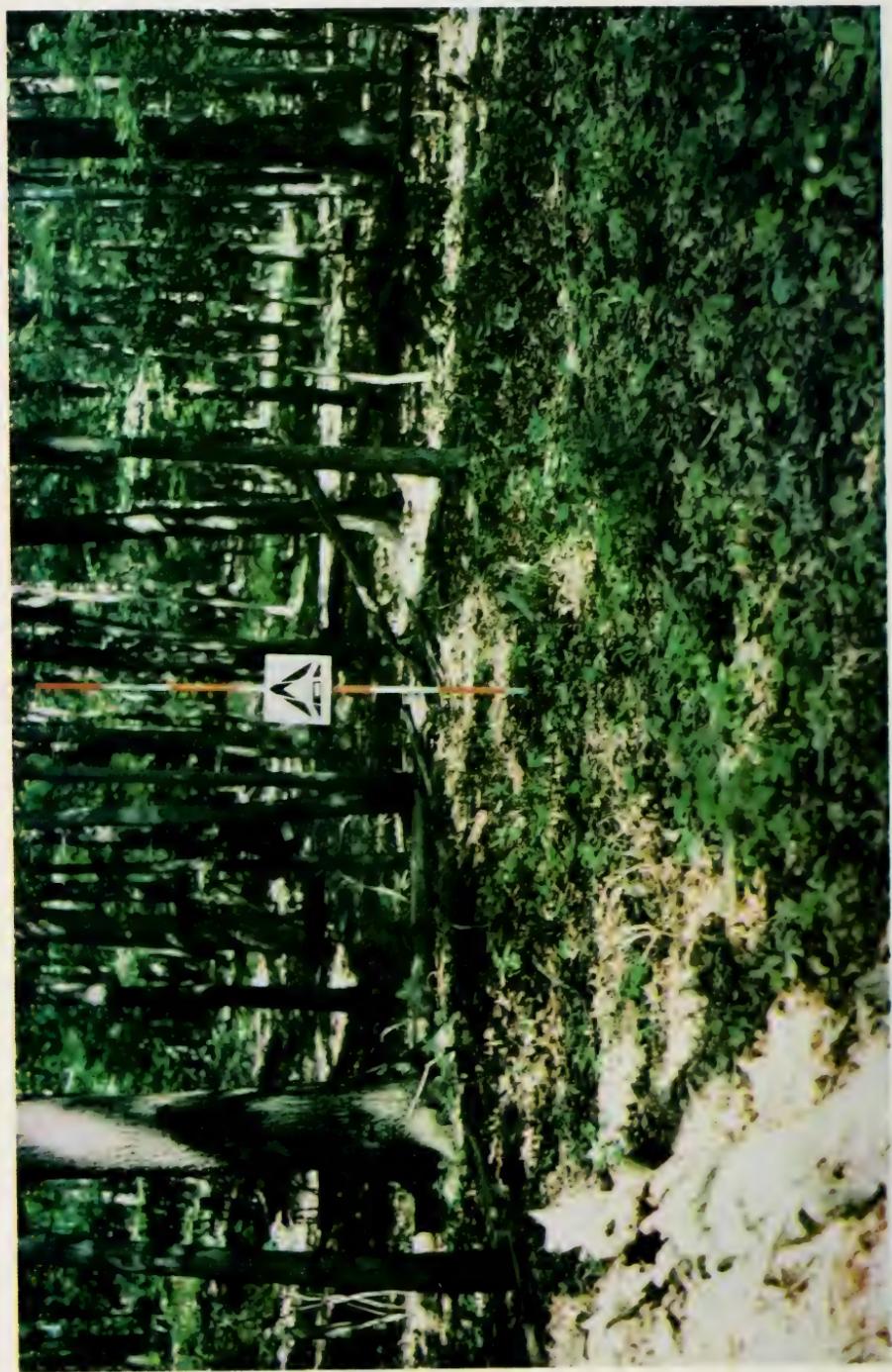
FUEL MODEL

Fire Behavior Fuel Model 8

REMARKS



LOADING				OTHER MEASUREMENTS		
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)		Average residue depth	(feet)	(percent)
0.25-1.0	1.1	55.1		Ground area covered by residue 1/4-inch diameter and larger	3.7	49
1.1-3.0	5.1	255.4		Average duff and litter depth		1.7
3.1-9.0)			Sound residue 3.1-inch diameter and larger		
9.1-20.0)	9.6	497.4	Mixed Oaks		50
20.1+)			Red Maple		27
Total	15.8	807.9		Others		19
				Rotted residue 3.1-inch diameter and larger		
					(percent)	4
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION		
Gross volume cruised (mbf/acre)				Stems cut/acre		
Net volume cruised (mbf/acre)				Stems remaining/acre		
Average stems/acre cut				Basal area/acre before		
Average d.b.h. of stems cut (inches)				Basal area/acre after		
Stand age (years)				Average d.b.h. before (inches)		
Cutting prescription				Average d.b.h. after (inches)		
Yarding method				Thinning method		
Slash treatment				Slash treatment		
Period since cut or treatment (months)				Mortality 70%		



LOADING				OTHER MEASUREMENTS			
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)	Average residue depth	Ground area covered by residue 1/4-inch diameter and larger	(percent)	(inches)	(feet)
0.25-1.0	1.7	86.5	Average duff and litter depth			2.6	0.5
1.1-3.0	2.8	142.4	Sound residue 3.1-inch diameter and larger				
3.1-9.0				Mixed Oaks	(percent)	80	
9.1-20.0				Red Maple	(percent)	10	
20.1+				Others	(percent)	5	
Total	16.6	847.9	Rotted residue 3.1-inch diameter and larger		(percent)	5	

HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION				FUEL MODEL	
Gross volume cruised (mbf/acre)		Stems cut/acre		Stems remaining/acre				Fire Behavior	Fuel Model
Net volume cruised (mbf/acre)		Basal area/acre before		Basal area/acre after				9	
Average stems/acre cut		Average d.b.h. before (inches)		Average d.b.h. after (inches)				130	
Average d.b.h. of stems cut (inches)		Average d.b.h. after (inches)		Average d.b.h. after (inches)					REMARKS
Stand age (years)		Thinning method		Thinning method					
Cutting prescription		Slash treatment		Slash treatment					
Yarding method		Period since cut or treatment (months)		Period since cut or treatment (months)					



LOADING				OTHER MEASUREMENTS		
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)		Average residue depth		(feet) 1.1
0.25-1.0	2.2	118.0		Ground area covered by residue 1/4-inch diameter and larger	(percent)	87
1.1-3.0	7.5	401.2		Average duff and litter depth	(inches)	2.8
3.1-9.0				Sound residue 3.1-inch diameter and larger	Mixed Oaks (percent)	71
9.1-20.0					Pitch Pine (percent)	10
20.1+					Misc. (percent)	10
Total	21.4	1134.0		Rotted residue 3.1-inch diameter and larger	(percent)	9

HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION			FUEL MODEL
Gross volume cruised (mbf/acre)	2.4			Stems cut/acre			
Net volume cruised (mbf/acre)	<u>2.1</u>			Stems remaining/acre			
Average stems/acre cut	<u>320</u>			Basal area/acre before			
Average d.b.h. of stems				Basal area/acre after			
Cut (inches) (saw timber)	<u>14"</u>			Average d.b.h. before (inches)			
Stand age (years)	<u>150</u>			Average d.b.h. after (inches)			
Cutting prescription	<u>clear cut</u>			Thinning method			
Yarding method	<u>rubber tired skidder</u>			Slash treatment			
Slash treatment	<u>none</u>						
Period since cut or treatment (months)	<u>6</u>						



Middle Branch Swamp
(South)

DATA SHEET

Residue descriptive code 11 322 CC

LOADING				OTHER MEASUREMENTS		
size class (inches)	Weight (tons/acre)	V ₃ volume (ft ³ /acre)	Average residue depth			(feet) 3.0
0.25-1.0	4.5	233.2	Ground area covered by residue 1/4-inch diameter and larger			(percent) 88
1.1-3.0	.5	25.2	Average duff and litter depth			(inches) 1.5
3.1-9.0			Sound residue 3.1-inch diameter and larger	Beech	(percent) 71	
9.1-20.0				Black birch	(percent) 10	
20.1+				Others	(percent) 12	
Total	32.0	1789.4	Rotted residue 3.1-inch diameter and larger			(percent) 7
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION		FUEL MODEL
Gross volume cruised (mbf/acre)	4.5			Stems cut/acre		Fire Behavior
Net volume cruised (mbf/acre)	4.1			Stems remaining/acre		Fuel Model
Average stems/acre cut				Basal area/acre before		12
Average d.b.h. of stems cut (inches)				Basal area/acre after		
Stand age (years)				Average d.b.h. before (inches)		
Cutting prescription	clear cut			Average d.b.h. after (inches)		
Yarding method	rubber tired skidder			Thinning method		
Slash treatment	none			Slash treatment		
Period since cut or treatment (months)						
						6



LOADING				OTHER MEASUREMENTS			
Size class (inches)	Weight (tons/acre)	$\frac{Vg}{3}$ June (ft ³ /acre)	Average residue depth	Ground area covered by residue 1/4-inch diameter and larger	(percent)	2.5 (inches)	(percent)
0.25-1.0	1.8	90.1	Average duff and litter depth			81	
1.1-3.0	8.8	440.7	Sound residue 3.1-inch diameter and larger			2.5	
3.1-9.0				Mixed Oaks	(percent)		
9.1-20.0	30.1	1548.7		Pitch Pine	(percent)	80	5
20.1+				Misc.	(percent)		10
Total	40.7	2079.5	Rotted residue 3.1-inch diameter and larger			5	

HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION				FUEL MODEL	
Gross volume cruised (mbf/acre)	4.2	Stems cut/acre						Fire Behavior	Fuel Model
Net volume cruised (mbf/acre)	3.6	Stems remaining/acre						11	11
Average stems/acre cut	350	Basal area/acre before							
Average d.b.h. of stems cut (inches) (saw timber)	16"	Basal area/acre after							
Stand age (years)		Average d.b.h. before (inches)							
Cutting prescription	seed tree	Average d.b.h. after (inches)							
Yarding method	rubber tired skidder	Thinning method							
Slash treatment	none	Slash treatment							
Period since cut or treatment (months)	10								

REMARKS	Pulpwood Data	Cruised 378.2 cu ft/acre	Average d.b.n. 7"
---------	---------------	--------------------------	-------------------



LOADING				OTHER MEASUREMENTS			
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)	Average residue depth				(feet)
0.25-1.0	2.12	111.39	Ground area covered by residue 1/4-inch diameter and larger				1.4
1.1-3.0	8.63	453.43	Average duff and litter depth				87
3.1-9.0			Sound residue 3.1-inch diameter and larger				3.9
9.1-20.0				Mixed Oaks			74
20.1+				Pitch Pine			13
Total	44.13	2321.26	Rotted residue 3.1-inch diameter and larger	Misc.			10
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION			
Gross volume cruised (mbf/acre)	1.21	Stems cut/acre		Fire Behavior	Fuel Model	Fuel Model	
Net volume cruised (mbf/acre)	1.04	Stems remaining/acre					12
Average stems/acre cut	320	Basal area/acre before					
Average d.b.h. of stems cut (inches)	14	Basal area/acre after					
Saw timber	95	Average d.b.h. before (inches)					
Stand age (years)		Average d.b.h. after (inches)					
Cutting prescription	clear cut	Thinning method					
Yarding method	rubber tired skidder	Slash treatment					
Slash treatment	none						
Period since cut or treatment	(months)						
	8						
REMARKS				Pulpwood Data			
Cruised 520.37 cu ft/acre				Average d.b.n.	8"		



Middle Branch Swamp
(North)

DATA SHEET

Residue descriptive code 14 B23 CC

LOADING				OTHER MEASUREMENTS		FUEL MODEL		
Size class (inches)	Weight (tons/acre)	Volume (ft ³ /acre)	Average residue depth	Ground area covered by residue 1/4-inch diameter and larger	(percent)	5.0	Fire Behavior	Fuel Model
0.25-1.0	7.9	407.7	Average duff and litter depth	(inches)	96			
1.1-3.0	1.8	95.1	Sound residue 3.1-inch diameter and larger	Beech	(percent)	2.6		
3.1-9.0				Black birch	(percent)	80		
9.1-20.0				Black cherry	(percent)	7		
20.1+					(percent)	12		
Total	62.3	3399.1	Rotted residue 3.1-inch diameter and larger		(percent)	1		
HARVEST INFORMATION				PRE-COMMERCIAL THINNING INFORMATION		FUEL MODEL		
Gross volume cruised (mbf/acre)	4.5	Stems cut/acre						
Net volume cruised (mbf/acre)	4.1	Stems remaining/acre						
Average stems/acre cut		Basal area/acre before						
Average d.b.h. of stems cut (inches)		Basal area/acre after						
Stand age (years)		Average d.b.h. before (inches)						
Cutting prescription	clear cut	Average d.b.h. after (inches)						
Yarding method	rubber tired skidder	Thinning method						
Slash treatment	none	Slash treatment						
Period since cut or treatment (months)	6							

